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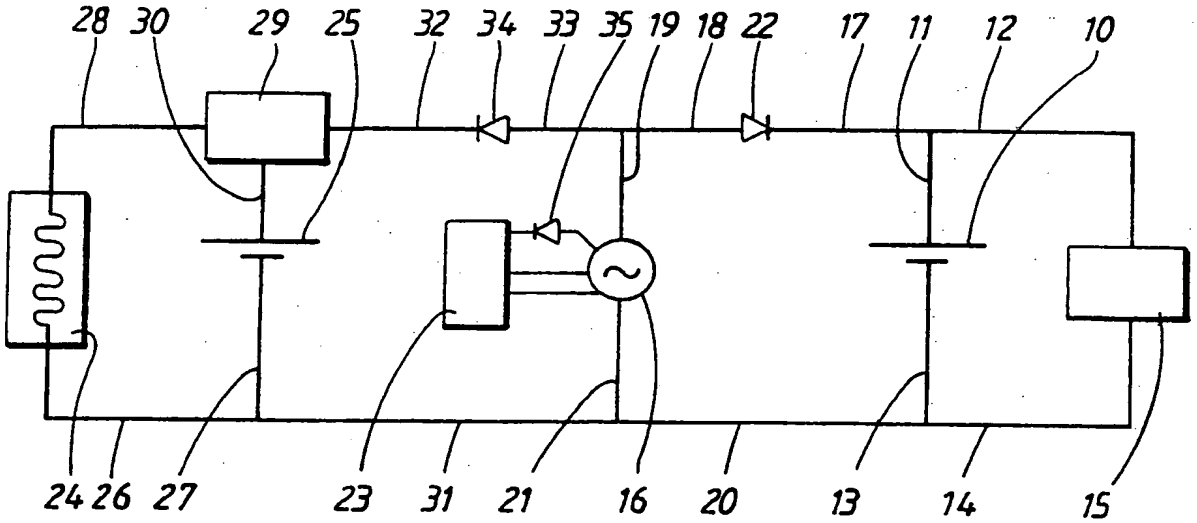
(54) Title: VEHICLE BATTERY CHARGING SYSTEM



(57) Abstract

An electrical supply system for a vehicle having a combustion engine. The system comprises a generator (16) and a battery accumulator (10) for respectively generating and storing of electricity together with at least one intermittently-working major load (24) for the electricity. Additionally included is a second battery accumulator (25) placed next to the major load (24) and a switching arrangement (29) which allows the connection of the major load (24) to said second battery accumulator.

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TITLE

Vehicle battery charging system

TECHNICAL FIELD

The invention concerns an electrical supply system for a vehicle equipped with a combustion engine, comprising a generator and a battery accumulator for respectively generating and storing of electricity together with at least one intermittently-working major load for the electricity.

TECHNICAL BACKGROUND

In many vehicles with combustion engines, catalytic converters are used for purification of the engine's exhaust gases. In order that the catalytic converter functions optimally it is necessary that it has reached its working temperature (200-400°C). If the temperature of the surroundings is low it can take several minutes of driving before the catalytic converter has been warmed up to working temperature by the engine's exhaust gas flow. Fuel consumption is notably increased during cold-starting, before the engine attains its normal working temperature. It is therefore important that the catalytic converter's purifying capacity is utilised during as large a part of the cold-starting process as possible.

The warming up time can be reduced to circa 0.5-2.0 minutes, depending on the temperature of the surroundings, by employing electrical heating of the catalytic converter. However, a very large amount of electrical power (3-7 kW) is required during the heating process. This additional heating element produces a hefty increase in the load on the electrical system, often combined with the defroster and lighting which means that the car's battery accumulator, which is adversely affected by the cold, has difficulty in accomplishing repeated cold starts. Since modern cars have more and more electronics for the monitoring of different functions, e.g. ABS-brakes, higher requirements are put on the reliability of the power supply

system. Even if the vehicle's electrical system manages to start the engine there is a risk that the heating of the catalytic converter which starts immediately thereafter will take up the whole of the generator power, such that the other electrical loads have to compete for the starting battery's available power. There exists consequently a risk of functional disorders under extreme conditions of use.

The intermittent power requirement which is created by the heating of the catalytic converter can be compensated by an upgrading of the vehicle's generator and/or battery accumulator. A sufficiently large generator will however load the vehicle's engine severely during idling, which can lead to the engine stalling. Moreover, the amount of environmentally harmful emissions from the engine increase precisely during warming up of the engine, exactly contrary to the purpose of using the catalytic converter's heating arrangement. With an upgraded battery the risk of functional disorder is still present, since an abnormally low battery power can arise due to the use of parking lights and other electrically-loading members while the engine is not running.

TECHNICAL PROBLEM

An object of the invention is therefore to provide an electrical supply system for vehicles, which system can cope with being intermittently subjected to a large load.

SOLUTION

This object is achieved according to the invention, in that the electrical supply system comprises a second battery accumulator placed next to the major load and a switching arrangement which allows the connection of the major load to said second battery accumulator.

ADVANTAGES

By dividing the vehicle's battery capacity into two units, it is possible to maintain the battery, which is foreseen for heating the catalytic converter, almost fully charged.

Moreover both batteries can be placed in different positions in the vehicle, as close as possible to respective loads.

Other variations of the invention are evident from the subsequent dependent claims.

DESCRIPTION OF THE FIGURE

An embodiment of the invention will be described in more detail with reference to the accompanying drawing, which shows schematically an electrical supply system according to the invention.

PREFERRED EMBODIMENTS

The figure shows the invention very schematically with a conventional starting battery 10, the positive and negative terminals of which are connected via conductive parts 11, 12 and 13, 14 respectively to conventional loads 15. These include for example the vehicle's starter motor, the ignition system, the lighting system, the air conditioning system etc.

The starting battery's terminals are additionally connected to a battery charging generator 16 via conductive parts 11, 17 - 19 along with 13, 20 and 21. A diode 22 is inserted on the positive side between the conductive parts 17 and 18. The generator is foreseen with a combined rectifying and charging regulator 23.

The hitherto described charging system is essentially conventional. However, in the left part of the figure a heating arrangement 24 for the vehicle's catalytic converter has been connected. The heating arrangement 24 is connected to the negative terminal of said second battery via conductive parts 26, 27 and to said battery's positive terminal via conductive parts 28, 30 along with a switching device 29 placed between these.

The junctions 20, 21 and 26, 27 are joined to each other via a conductive part 31. The switching arrangement 29 is connected

with the generator's positive outlet via conductive parts 32, 33 which connect to the junction 18, 19 via a diode 34. The diodes 22 and 34 are inserted in order to separate the battery 25 from the ordinary electrical system. Additionally, a diode 35 is inserted between the generator 16 and the rectifying/charging regulator 23. The diode 35 is arranged to compensate for the voltage drop in the diodes 22, 34, so that the charging voltage across the batteries is increased.

In the normal operating position the switching device 29 is set up so that the battery 25 is connected with and receives charging current from the generator 16.

On cold starting, the battery 10 is used to start the engine. A sensor, not shown, which senses the catalytic converter's temperature is connected to the switching arrangement 29 and causes this to switch to a second operating position, which results in the conductors 28 and 30 being connected to each other. Energy from the battery 25 is consumed now by the heating arrangement 24 for warming up the catalytic converter. The battery 25, which is placed close to the catalytic converter, can receive charge from the generator 16, without the battery 10 being loaded. The temperature sensing means adjusts the switching device 29 back when the catalytic converter's working temperature is attained.

The switching arrangement 29 is additionally foreseen with an under-charge protector, which prevents connection of the heating arrangement when the voltage in the battery 25 is less than a particular value, for example about 10 volts.

The invention is not limited to the above described embodiment, but many variations are imaginable within the scope of the following claims. For example the diodes 22, 34 and 35 can be placed together, either inside or outside the generator housing. The switching arrangement 29 can be formed as a direct current converter, so that the battery 25 is charged with a higher voltage and consequently quicker than the battery 10.

The switching device 29 can also be foreseen with a means for measuring the charge output of the battery 25, when the heater arrangement 24 is used. Accordingly the voltage for recharging can be chosen in such a way that recharging occurs in the fastest possible way, without the remaining electrical system's voltage dropping.

Claims

1. Electrical supply system for a vehicle equipped with a combustion engine, comprising a generator (16) and a battery accumulator (10) for respectively generating and storing of electricity together with at least one intermittently-working major load (24) for the electricity, characterized by a second battery accumulator (25) placed next to the major load (24) and a switching arrangement (29) which allows the connection of the major load (24) to said second battery accumulator.

2. Electrical supply system according to claim 1, characterized in that the switching arrangement (29) includes a means for sensing of under-voltage in the second battery accumulator (25), which means is arranged to prevent the connection of the major load (24) when the accumulator voltage is less than a known predetermined value.

3. Electrical supply system according to claim 1 or 2, characterized in that the second battery accumulator (25) is connected with the remaining part of the system via a first diode (34), in order to prevent current moving in a direction towards the first accumulator or any of the ordinary current loads (15) in the system, and in that a second diode (22) is placed between the generator (16) and the first accumulator (10), in order to prevent current moving from this accumulator (10) in a direction towards the major load (24) or the other accumulator (25).

4. Electrical supply system according to claim 3, characterized in that the switching arrangement (29) is adjusted so that on switching from a normal position, in which the second accumulator (25) is connected to the generator (16), the connection to the generator is broken and the connection with the major load (24) is established, so that the generator can deliver its power to the other parts of the system.

5. Electrical supply system according to any of claims 1 to 4, c h a r a c t e r i z e d in that a third diode (35) is mounted by the generator (16), in order to increase the charging voltage across the batteries (10, 25).

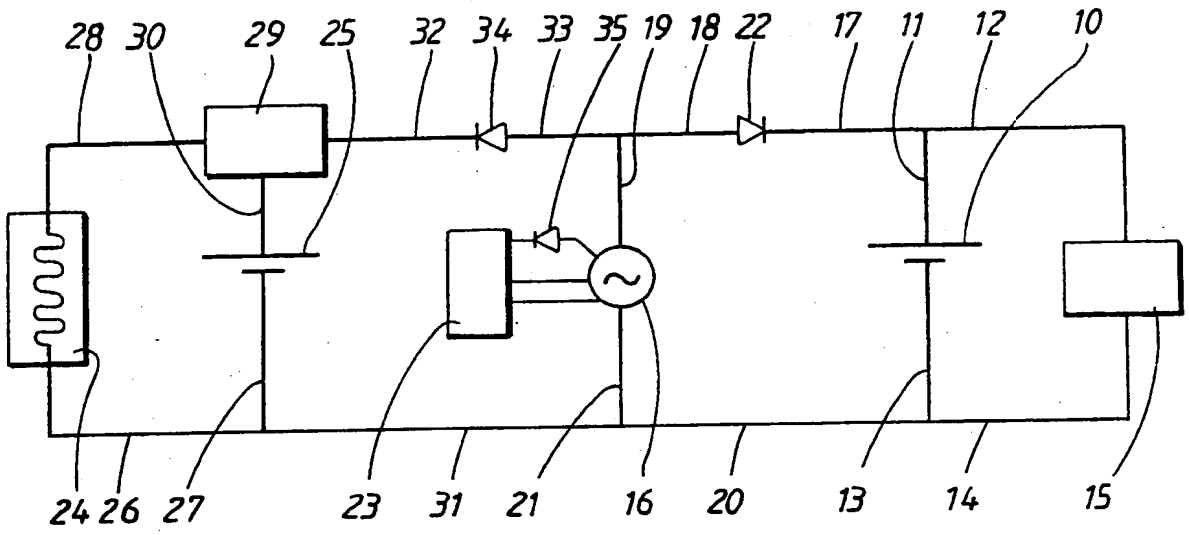
6. Electrical supply system according to claim 5, c h a r a c t e r i z e d in that the diodes (22, 34, 35) are mounted inside a rectifier/charging regulator (23) for the generator.

7. Electrical supply system according to claim 5, c h a r a c t e r i z e d in that the diodes (22, 34, 35) are mounted on the outside of a rectifying/charging regulator (23) for the generator.

8. Electrical supply system according to any of claims 1 to 7, c h a r a c t e r i z e d in that the switching device (29) comprises a direct current converter, which is arranged to step up the voltage from the generator (16) to a higher voltage, so that the charging of the second accumulator (25) is accelerated.

9. Electrical supply system according to claim 8, c h a r a c t e r i z e d in that the switching device (29) comprises means for recording the charge output upon use of the major load (24) and means for controlling the recharging, in order that a corresponding charge recharges the accumulator (25) in the fastest possible way without the remaining electrical system's voltage dropping, and without the accumulator (25) being damaged.

10. Electrical supply system according to any of claims 1 to 9, c h a r a c t e r i z e d in that the major load (24) consists of an electrical arrangement for heating of an exhaust catalytic converter.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INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 92/00084

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: B 60 R 16/04, H 02 J 7/14, B 01 D 53/36

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	B 60 R; H 02 J; B 01 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	På Kryss & Till Rors, Vol. 48, No. 4, April 1977 (STOCKHOLM) NILS LUNDQVIST: "DEN ELEKTRISKA INSTALLATIONEN OMBORD", see page 20 - page 23; page 21, column 3, line 10 - line 15 figure 2, schema B	1,3,5-7
Y		2,4,8-10
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X	US, A, 3763415 (C.H. OWNBY) 2 October 1973, see column 5, line 54 - column 6, line 30; figure 3	1,3
Y		2,4,8-10
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Y	WO, A1, 8912343 (DORNBUSCH, B. D.) 14 December 1989, see abstract; claims 1-3,17	2
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* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
15th May 1992	1992 -05- 22
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Åke Vängborg

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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

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Y	GB, A, 1602462 (LUCAS INDUSTRIES LIMITED) 11 November 1981, see column 1, line 9 - line 38 --	8
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A	US, A, 4307789 (M.M. BERTOT) 29 December 1981, see column 3, line 3 - line 5; abstract; figure 1 --	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 92/00084

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 28/03/92
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